New species of Raspailiidae (Porifera: Demospongiae: Poecilosclerida) from southeast Queensland

John N.A. HOOPER

Patricia SUTCLIFFE

Monika A. SCHLACHER- HOENLINGER

Biodiversity Program, Queensland Museum, PO Box 3300, South Brisbane, Qld, 4101, Australia. Email: john.hooper@qm.qld.gov.au.

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ABSTRACT

Extensive surveys of the marine benthos throughout tropical Australasia over the past two decades have revealed a large number of sponge species, most of which appear to be new to science. Even in the comparatively well-known Moreton Bay region, we discovered four new species belonging to three genera of the family Raspailiidae, and also increased the number of known species living in this area from three to eleven, in some cases greatly increasing their known distributional range. Other new extralimital records of these species are provided, as is a revised checklist of the Australian raspailiid fauna. ❑ *Porifera, Demospongiae, Poecilosclerida, Microcionina, Raspailiidae, Raspailia, Aulospongus, Ceratopsion, Sollasella, Echinodictyum, new species, taxonomy, species check list, Moreton Bay, Queensland.*

Over the past decade our knowledge of the tropical Australian sponge fauna has increased substantially thanks to several major benthic surveys (e.g. http://www.reeffutures.org/topics/biodiversity/seafloor_second.cfm), and biodiscovery programs, searching for new compounds from nature with potential pharmaceutical properties (e.g. Quinn *et al.* 2002). These surveys have primarily focussed on Queensland waters including the coast, coral reefs and the inter-reef regions of the Great Barrier Reef, to the adjacent 'sea mounts' and off-shore reefs in the Coral Sea, and the Gulf of Carpentaria (e.g. Hooper *et al.* 2002). Prior to these surveys about 430 species had been described from these regions (Hooper & Wiedenmayer 1994), but since then over two thousand morphospecies have been collected, many thought to be new to science.

Amongst the families of Porifera, the family Raspailiidae is moderately diverse, within the class Demospongiae, containing 20 valid genera (one *incertae sedis*), seven subgenera, and approximately 250 named species worldwide, mainly from shallow waters and a few from abyssal depths (Hooper 2002; and literature therein). From this growing body of literature the Australian raspailiid fauna was assumed to be relatively well known, including a comprehensive taxonomic monograph (Hooper 1991), several subsequent papers on Australian and western Pacific islands faunas (Hooper & Lévi 1993; Hooper *et al.* 1999; Van Soest *et al.* 2006), several more dealing with other aspects of their biodiversity (Hooper & Lévi 1994; Hooper *et al.* 2000), and a synthesis of the family's systematic relationships and their morphological characteristics (Hooper 2002). Together these contributions have described a fauna of 59 species from Australian waters (including territorial seas) up to the present time, but only three species were previously recorded from the Moreton Bay region (Hooper 1991; Hooper & Lévi 1993; Van Soest *et al.* 2006).

Recent collections since the publication of Hooper (1991), particularly the comprehensive collection effort in 2005 during the 'Thirteenth International Marine Biological Workshop - The Marine Fauna and Flora of Moreton Bay', revealed another eight species of raspailiids living in this supposedly well known Moreton Bay fauna, including four new species described here.

Moreton Bay, including faunas inside the Bay and on the oceanic side of North Stradbroke and Moreton Islands, contains some of the most ecologically diverse environments on the east coast of Australia and a rich biota living in a biogeographic transition zone between tropical and temperate influences (Davie & Hooper 1998). Being adjacent to Brisbane (population circa 2 million) the area is probably under immense urban pressure, yet the fauna continues to reveal new discoveries despite many decades of collection effort. This present paper describes new species and records of the family Raspailiidae from this region, and an updated checklist of raspailiid species from Australia.

MATERIALS AND METHODS

Specimens were collected by SCUBA, trawls and scientific dredges, and are housed in the collections of the Queensland Museum. Only new material, published since the earlier revision of Australian Raspailiidae (Hooper 1991), is recorded here and readers are referred to that earlier publication for a full listing of examined material. Specimens were prepared for light and SEM microscopy using the usual methods (e.g. Hooper & Van Soest 2006). Spicule measurements are based on 30 spicules of each category and denoted as ranges (and means) of length x width. The systematic assignment follows the 'Systema Porifera' (Hooper & Van Soest 2002). Abbreviations used in the text: AIMS, Australian Institute of Marine Science; CSIRO, Commonwealth Scientific and Industrial Research Organisation; GBR, Great Barrier Reef, Queensland, Australia; NSW, New South Wales; NT, Northern Territory; NTM, Northern Territory Museum; Qld, Queensland; QM, Queensland Museum; WA, Western Australia.

SYSTEMATICS

Phylum Porifera Grant, 1836

Class Demospongiae Sollas, 1885

Order Poecilosclerida Topsent, 1928

Suborder Microcionina Hajdu, Van Soest & Hooper, 1994

Family **Raspailiidae** Nardo, 1833

Raspeliae Nardo, 1833.
Raspailiae Nardo, 1847.
Raspailiidae Hentschel, 1923.
Euryponidae Topsent, 1928.

Definition. Microcionina with a special category of smaller ectosomal styles, oxeas or anisoxeas forming discrete bouquets around the protruding larger styles or oxeas.

Remarks. Raspailiids are currently assigned to the Poecilosclerida but lack the primary apomorphy (chelae microscleres) of this order. They are assigned to the Microcionina based on similarities in morphological and some chemical features with the family Microcionidae in particular (refer to the synthesis provided by Hooper 2002). Genera are differentiated mainly on the basis of three morphological characters: (a) skeletal architecture ranging from axial compression to reticulate, plumo-reticulate or plumose skeletons; (b) the presence or absence of a specialised ectosomal skeleton (apomorphic for the family, whereby brushes of small ectosomal megascleres surround long protruding single choanosomal megascleres); and (c) geometric modifications to echinating megascleres. Full synonymies and diagnoses of all higher taxa are provided by Hooper (2002), with recent additions by Van Soest *et al.* (2006).

Subfamily **Raspailiinae** Nardo, 1833

Raspailia Nardo, 1833

Definition. Raspailiidae with a more-or-less compressed axial skeleton and a radial, plumose or simply reticulate extra-axial skeleton, with choanosomal spicules consisting of two, three or more different size classes (styles and/or oxeas), and echinating acanthostyles microcionid-like or secondarily modified.

Raspailia (*Raspailia*) Nardo, 1833

Definition. *Raspailia* with microcionid-like acanthostyles, myxillid-like acanthostyles or thin vestigial acanthostyles.

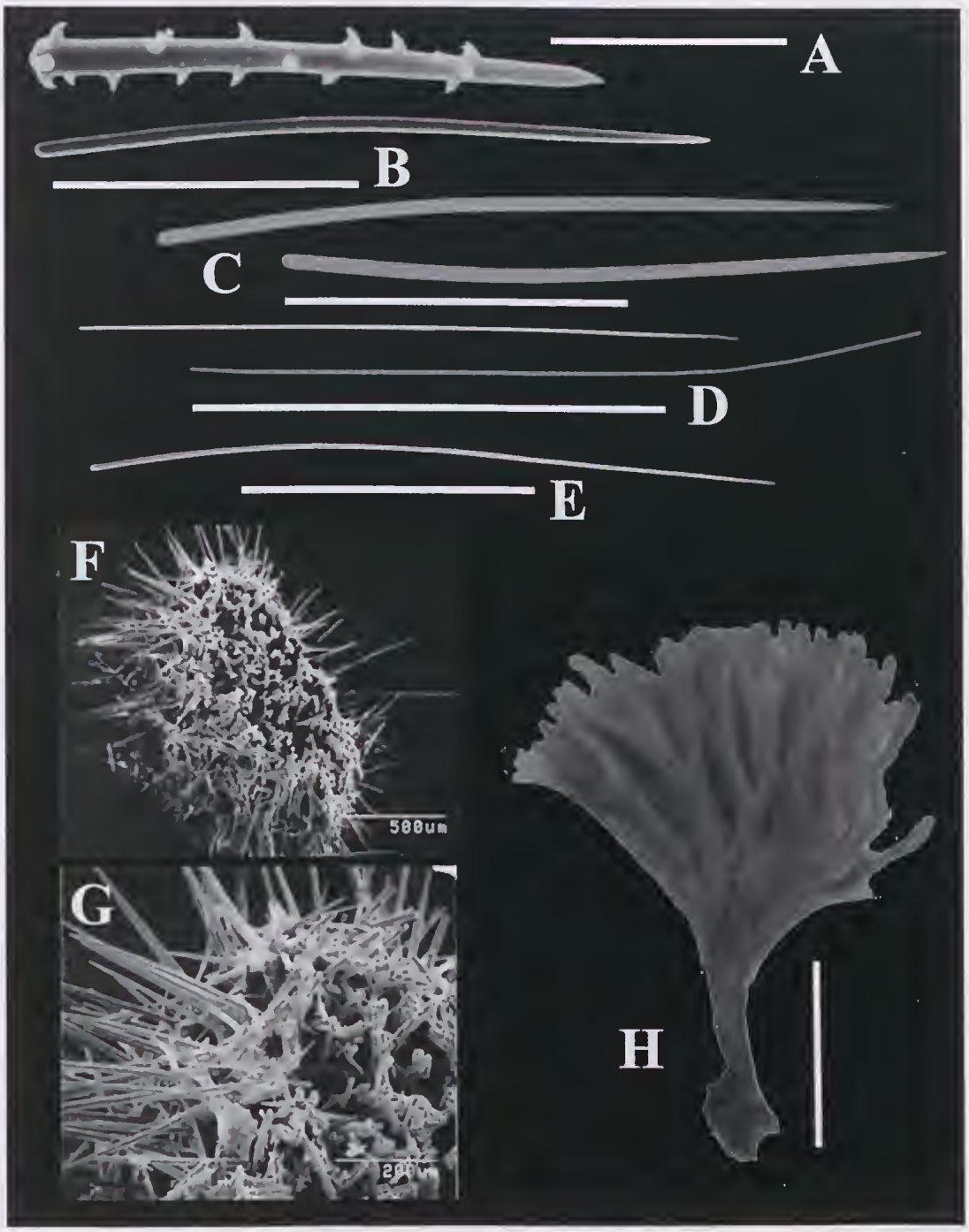

FIG. 1. *Raspailia (Raspailia) scorpa* sp. nov. (holotype QM-G315208). **A**, Echinating acanthostyles (scale bar 50 μm). **B**, Choanosomal style (scale bar 200 μm). **C**, Choanosomal styles (scale bar 200 μm). **D**, Ectosomal styles (scale bar 200 μm). **E**, Subectosomal style (scale bar 500 μm). **F**, SEM of skeletal structure, showing the axially compressed choanosome and radial subectosomal megascleres. **G**, SEM of ectosome, showing arrangement of ectosomal styles, radial echination of choanosomal styles and reticulation of choanosomal styles. **H**, Holotype (scale bar 2cm).

Raspailia (*Raspailia*) *scorpa* sp. nov.
(Figs 1, 2A, 8A, Table 1)

Material Examined. HOLOTYPE: QM-G315208, Green I., Moreton Bay, Qld, 27°25.5'S., 153°13.5'E., 4 m, 16.03.1999, coll. Marine Parks impoundment.

Habitat and Distribution. Coral rubble, 4 m depth range. So far known only from the type locality in Moreton Bay (Fig. 2A).

Description. *Shape.* Small arborescent sponge, approximately 5cm high, resembling a straw broom, with a dense crown of erect, flattened branches, many bifurcating several times at their tips. Branches occur in more than one plane giving a shrub-like appearance. Stalk is 1.8 cm long, 35–55 mm diameter, slightly flattened, firm, with basal holdfast. Branching occurs multiple times and occasionally fuses again towards the top. At the first bifurcation from the stalk the diameter ranges from 4–5 mm. When smaller branches (1.5–3 mm diameter) arise from this common base, they usually divide again 2–3 times, however they retain a similar width (23.5 mm) to the first branch. All branches are flattened equally, and range in thickness from 0.7–1 mm.

Colour. Deep red on deck, beige when preserved.

Oscules. Not observed.

Texture and surface characteristics. Firm but easily torn, slightly rubbery with flexible branches. Surface regular but very hispid.

Ectosome and subectosome. Ectosome exceptionally hispid as a result of protruding megascleres of several different categories, Subectosomal styles protrude through the surface up to 2 mm from the ectosome, in regular but sparse intervals. Shorter choanosomal styles protrude for only a small distance (<0.25 mm) through the ectosome but form a dense palisade-like surface layer. Ectosomal styles form a multispicular tangential layer arranged in tangential bundles around the point of insertion of subectosomal styles through the surface. Ectosome and subectosomal regions contain a well developed light brown layer of collagen in contrast to the choanosome which has only a very lightly collagenous mesohyl.

Choanosome. Choanosomal skeleton is axially compressed, consisting of a dense reticulation of choanosomal styles with only very few echinating acanthosyles visible. The choanosomal skeleton is dense and homogenous throughout the entire section (1.4–2.8 mm x 0.4–0.6 mm), surrounded by a subectosomal region ranging from 0.05–0.25 mm thick. Fibres are not well developed and mesohyl is clear, homogenous and lightly collagenous.

Megascleres (refer to Table 1 for dimensions). Ectosomal styles are very fine, sinuous, with evenly rounded bases and sharp points.

Subectosomal styles are very long, thin, usually sinuous, some with very slight subtylote swelling at the base but most evenly rounded bases.

Choanosomal styles are robust, curved at the centre or towards the basal end, most with sharply tapering points but some are slightly telescoped.

Echinating acanthostyles typically have a flattened, only slightly swollen base bearing several recurved spines arising at the very base of the shaft and forming a small clump. Spination along the shaft is very sparse, with a regular continuation of spines extending into the midsection, leaving the point bare. Spines with recurved hooks (3–4 μm long).

Remarks. *Raspailia (Raspailia) scorpa* sp. nov. is similar to *R. (R.) gracilis* (Lendenfeld) in gross morphology but differs in most other details (see Hooper 1991: 1206, Fig. 10). Conversely, despite differences in gross morphology *R. (R.) scorpa* is most similar to *R. (R.) phakellopsis* Hooper from the NT and northern WA in its skeletal structure and spicule composition, including the characteristic pattern of spination on echinating acanthostyles. In both species the subectosomal and choanosomal styles radiate in a similar fashion from the densely reticulate axial skeleton. However, the species clearly differ: *R. (R.) scorpa* has ectosomal styles (versus oxeas in *R. phakellopsis*), fewer and more robust and more recurved spines on the acanthostyles, and in the specific dimensions of most megascleres. *Raspailia phakellopsis* also has flattened convoluted leaf-like branches superficially resembling blades of brown alga (Hooper 1991), in contrast the straw broom-shaped growth form of the present species. There is also a contrasting arrangement of ectosomal styles, with *R. (R.) scorpa* having tangential bundles surrounding the protruding subectosomal styles, differing from *R. phakellopsis* which has erect bouquets or brushes typical of many raspailiids.

So far this species is known only from a single specimen from Moreton Bay, despite extensive surveys of the benthic faunas both north and south of this locality over the past decade. It is clearly a sister-species of *Raspailia phakellopsis*, which has a recorded distribution from Darwin, NT, and the Northwest Shelf, WA, both representing another example of east-coast/west- coast sister species pairs (Hooper 1991).

Etymology. This species is named for its broom-shaped gross morphology (L., *scorpa*, thin twigs, broom).

Raspailia (Raspailia) kennedyi sp. nov.

(Figs 2A, 3, 8B–C, Table 2)

Material Examined. HOLOTYPE: QM-G317177, Moreton Bay, off Toondah Harbour, Cleveland, Qld, 27°30.5'S, 153°18.1'E, 8 m, 2.viii.2000, J.A. Kennedy & T. Wassenberg.

Habitat and Distribution. The type specimen was collected from a seawater intake grate at a depth of 8 m. So far known only from the type locality in Moreton Bay (Fig. 2A).

Description. *Shape.* Large arborescent sponge on a single erect stalk (30 mm long) with round basal holdfast (13 mm diameter). First branching from the stalk is in one plane, with total branch span 15 cm wide. Numerous erect branches arise from the primary branches in the same plane and spread in one direction only. This may be as a direct result of the constricting sponge habitat (found growing on a grate and thus restricted in direction of growth). Branches separate many times in an irregular pattern and occasionally fuse again, creating a dense flattened shrub-like morphology. There appears to be no distinct pattern for fusion of branches except for proximity of branch growth. Branches have small forked distal tips. Branches vary in length, with the largest 12 cm long, and slightly flattened (25–54 x 21–42 mm). Total sponge height is 15cm.

Colour. Dark mauve-brown alive, darkening in air, and very dark brown in ethanol. Stains ethanol a light brown colour upon preservation.

Oscules. Minute (<1 mm) sparsely scattered along the sides of branches.

Texture and surface characteristics. Branches are flexible and compressible with a velvety feel, and easily torn. Surface is very hispid. The main stalk is very firm, almost woody, and not flexible.

Ectosome and subectosome. Dense bouquets of small ectosomal styles or anisoxeas protrude through the surface at regular intervals surrounding single large subectosomal styles, the latter protruding between 320–700 μm from the surface, visible with the naked eye and creating a very hispid surface. The subectosomal region has a layer of darkly pigmented layer of collagen (200–450 μm).

Choanosome. Strong axial compression with multispicular primary tracts of choanosomal styles. Secondary tracts usually lack spicules and consist only of spongin fibres, or some secondary tracts are unispicular. There is a high proportion of acanthostyles regularly echinating the primary tracts, and fibres are well developed and darkly pigmented.

Megascleres (refer to Table 2 for dimensions). Structural choanosomal styles are uniform and slightly curved at the centre, with evenly rounded bases and tapering to sharp points.

Subectosomal styles are long and thin, with evenly rounded bases, tapering sharp points, and slightly curved at centre or towards basal end.

Ectosomal styles or anisoxeas are short, very thin, straight or very slightly curved and difficult to see using light microscopy.

Echinating acanthostyles are short and robust, slightly subtylote bases, with small spines concentrated around the tip and covering the basal tyle and the neck of the shaft ranges from bare to lightly covered in short spines. Spines are erect near the basal end and slightly recurved towards the point, about 2 μm long,

Remarks. *Raspailia (Raspailia) kennedyi* sp. nov. is typical of the genus in its spicule composition and skeletal structure. The species is similar in shape (spiky surface, arborescent and multiple bifurcate branching, darkly pigmented) and ectosomal structure to *Raspailia vestigifera* Dendy from northern, northwest and central west Australia (see Hooper, 1991: 1215). Ectosomal brushes in both species are typically raspailiid, consisting of very fine styles (some verging on anisoxeas), forming bouquets around protruding single long subectosomal styles. The choanosomal region, however, is better developed in *R. (R.) kennedyi*, with multispicular primary tracts radiating to the surface and secondary spongin or unispic-

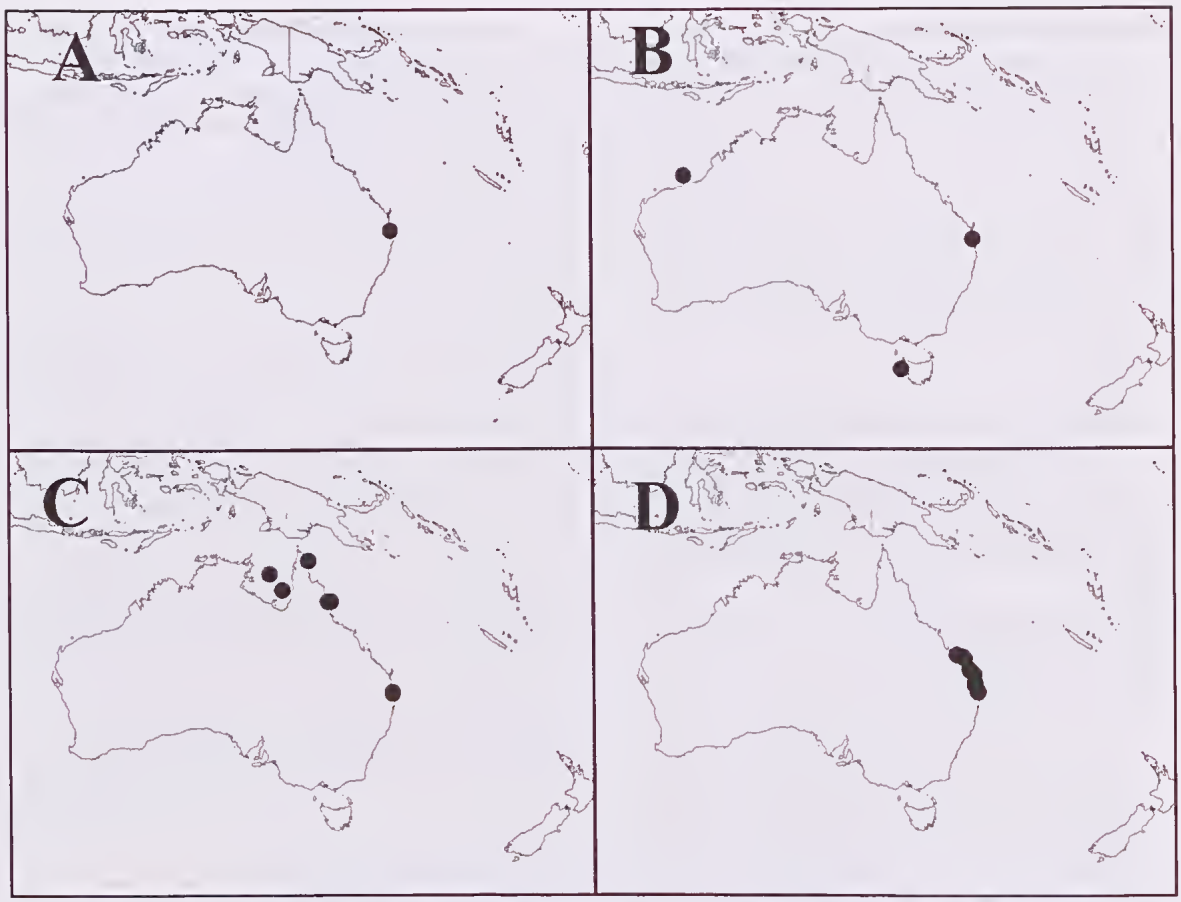

FIG. 2. Maps of wider distributions of *Raspailia* species found in Moreton Bay. **A**, *R. (Raspailia) scorpa* sp. nov. and *R. (Raspailia) kennedyi* sp. nov. **B**, *R. (Raspaxilla) compressa*. **C**, *R. (Parasyringella) australiensis*. D, *Aulospongus similiaustralis* sp. nov.

ular tracts of styles. Moreover, the choanosomal megascleres of *R. vestigifera* are strongylote and the species characteristically has few echinating acanthostyles, differing significantly from *R. (R.) kennedyi*.

Etymology. This species is named in appreciation of Mr John Kennedy, collector of the only known specimen of this species, and in recognition of his long and highly productive contributions to sponge biology at the QM.

Raspailia (*Raspaxilla*) Topsent, 1913

Definition. *Raspailia* with echinating rhabdostyles geometrically very different from the usually longer choanosomal styles (the latter without any basal rhabd); extra-axial styles forming a radial skeleton perpendicular to the axis; and well differentiated axial and extra-axial skeletons (the former compressed, the latter plumoreticulate and/or radial).

Raspailia (*Raspaxilla*) *compressa* Bergquist, 1970

(Fig. 2B, 8D)

Raspailia compressa Bergquist, 1970: 29–30, text-fig. 3a, pls 7b, 11a.

Raspailia (Raspaxilla) compressa — Hooper, 1991: 1245–1248, figs 32–33, table 6.

Material Examined. QM-G304878, South side Mudjimba I., off Mooloolaba, Qld, 26°37.02'S, 153°6.15'E, 12 m, J.N.A. Hooper, J.A. Kennedy & S.D. Cook, 30.01.1995. QM-G323281, Pieman Canyon, Southeast Canyons, Tasmania, 41°44.38'S, 144°33.59'E, 176 m, A. Williams CSIRO RV 'Southern Surveyor' SS200404, dredge. Further material as listed in Hooper (1991).

Habitat and Distribution. 12–176 m, hard substrata. Known from North Cape, New Zealand

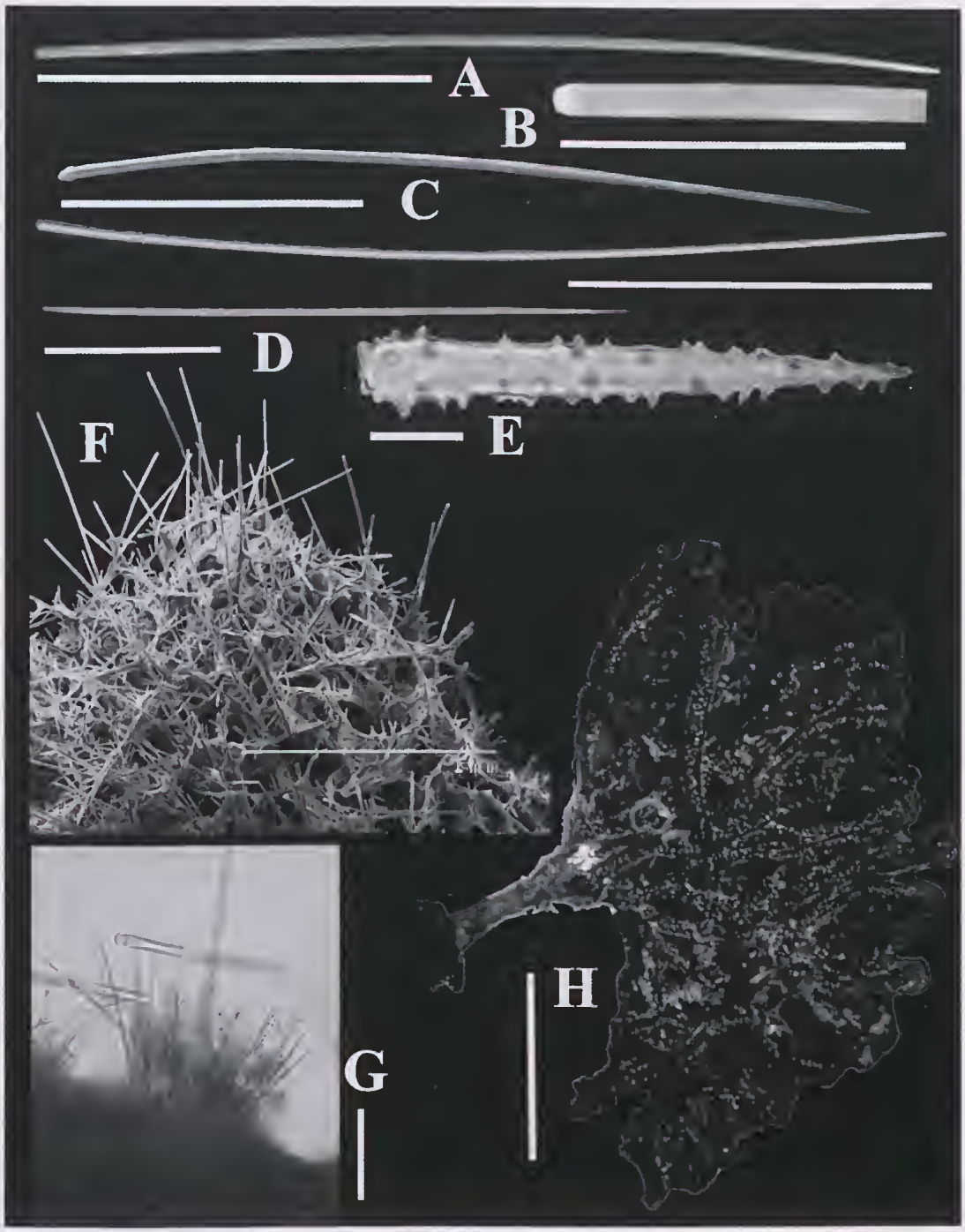

FIG. 3. *Raspailia (Raspailia) kennedyi* sp. nov. (holotype QM-G317177). A, subectosomal style (scale bar 500 µm). B, base of ectosomal style (scale bar 100 µm). C, choanosomal styles (scale bars 200 µm). D, ectosomal style (scale bar 100 µm). E, echinating acanthostyle (scale bar 10 µm). F, SEM of choanosome and ectosome, showing arrangement of styles in primary tracts and protruding subectosomal styles responsible for the hispid surface (scale bar 1 mm). G, light microscopy of bouquets of ectosomal styles surrounding a single subectosomal style (scale bar 100 µm). H, holotype on deck (scale bar 5 cm).

(type locality), Port Hedland region, WA, SE coast (Southeast Canyons), Tasmania, and the Moreton Bay region, SE Qld.

Remarks. This species was initially known only from the New Zealand type locality (Bergquist 1970), and subsequently comprehensively redescribed from deeper waters on the west coast of Australia (Hooper 1991). The new records reported here from deeper waters off the west coast of Tasmania and shallow waters in SE Queensland greatly extends the known range of this species, and indicates from these significantly disjunct distributions that it is probably a member of the temperate fauna, with the Moreton Bay record being a single incursion into subtropical waters, and that it is probably far more widely distributed than presently known. This species characteristically has an arborescent, bifurcating digitate growth form with cylindrical or slightly flattened branches, live colouration yellow-brown to olive-brown, an optically very hispid surface, and firm, barely compressible stalk with branches more flexible.

Raspailia (*Parasyringella*) Topsent, 1928

Definition. *Raspailia* which have secondarily lost their echinating megascleres.

Raspailia (*Parasyringella*) *australiensis* Ridley, 1884

(Fig. 2C, 8F)

Raspailia (Syringella) australiensis Ridley, 1884: 460; Pick, 1905: 18, 35; Vosmaer, 1912: 316. Hooper, 1991: 1256–1259, figs 39–40, table 7.

Homaxinella australiensis — Burton, 1934: 42.

Material Examined. QM-G303010, NE Cape Grenville, Shelburne Bay, Qld, 11°55.03'S, 143°26.99' E, 51 m, S.D. Cook on FV 'Clipper Bird', 22.iii.1993, trawl. QM-G300814, E of Groote Eylandt, Gulf of Carpentaria, NT/Qld, 13°30.08'S, 138°47.08'E, 54 m, S.D. Cook on CSIRO RV 'Southern Surveyor', 24.xi.1991, trawl. QM-G320826, Gulf of Carpentaria, Qld, 15°20.04'S, 140°19.83'E, 28 m, C. Bartlett & S.D. Cook on CSIRO RV 'Southern Surveyor' 2380403, 24.v.2003. trawl. QM-G320811, Gulf of Carpentaria, Qld, 15°20.03'S, 140°19.83'E, 28 m, C. Bartlett & S.D. Cook on CSIRO RV 'Southern Surveyor' 2380403, 25.v.2003, trawl. Further material as listed in Hooper (1991).

Habitat and Distribution. 7–54 m depth, on mud, sand or rubble substrates. Probably widely distributed in tropical north and north -east Australia, with confirmed records so far from Darwin, Northern Territory (type locality), Groote Eylandt NT and Gulf of Carpentaria, NT/Qld, northern section of the Great Barrier Reef to Moreton Bay, southern Qld (Fig. 2C).

Remarks. This species was comprehensively redescribed and illustrated in Hooper (1991), and is recognisable by its long stringy unbranched cylindrical growth form, muddy brown to whitish live colouration, its firm, flexible texture with a woody central stem and fleshy branches, and an optically even but microscopically rugose surface. It was originally recorded from Darwin (Ridley 1881), and subsequently from two other disjunct populations on the outer reefs on the northern section of the Great Barrier Reef, and the southern part of Moreton Bay (Macleay I.) in SE Queensland (Hooper 1991). The new material listed here from the inner far northern GBR and the Gulf of Carpentaria fills in the species' known, previously disjunct distribution.

Anlospongus Norman, 1878

Definition. Raspailiidae with at least two size classes of rhabdostyles of similar geometry, the larger (smooth or partially spined) core spongin fibres, and the smaller (partially spined) echinate fibres although neither are localised to any region of the skeleton; choanosomal skeletal structure is predominantly plumose, with spicules and fibres amalgamated into bulbous tracts ('fibre-bundles'), more-or-less compacted in the axial skeleton, becoming increasingly plumose as they ascend to the periphery, eventually producing a shaggy, compartmentalised or conulose surface; axial and extra-axial skeletons undifferentiated apart from greater amalgamation of fibre-bundles in the axis.

Anlospongus similiaustralis sp. nov.

(Figs 2D, 4, 8E, Table 3)

Material Examined. HOLOTYPE: QM-G300079, Shag Rock, SE Corner, North Stradbroke I., Qld, 27°24.5'S, 153°31.4'E, 15 m, 05.ii.1992, J.N.A. Hooper & J. Wilkinson, SCUBA. PARATYPES: QM-G315526, Western tip of Northwest I., Capricorn/Bunker Group, GBR, Qld, 23°18.4'S, 151°42.6'E, 15.7 m, 09.vi.1999, S. Cook *et al.* QM-G317317, Double Rock, Elliot Heads, Qld, 24°53.5'S, 152°29.3'E, 7.8 m, 11.x.2000, S.D. Cook *et al.* QM-G320085, southeast side, Outer Rock, Keppel Is, GBR, Qld, 23°3.5'S, 150°57.1'E, 15.8 m, 05.xi.2002, J.N.A. Hooper *et al.* OTHER MATERIAL. QM-G303218, Amity Pier and boat ramp, N Stradbroke I., 27°24.13'S,

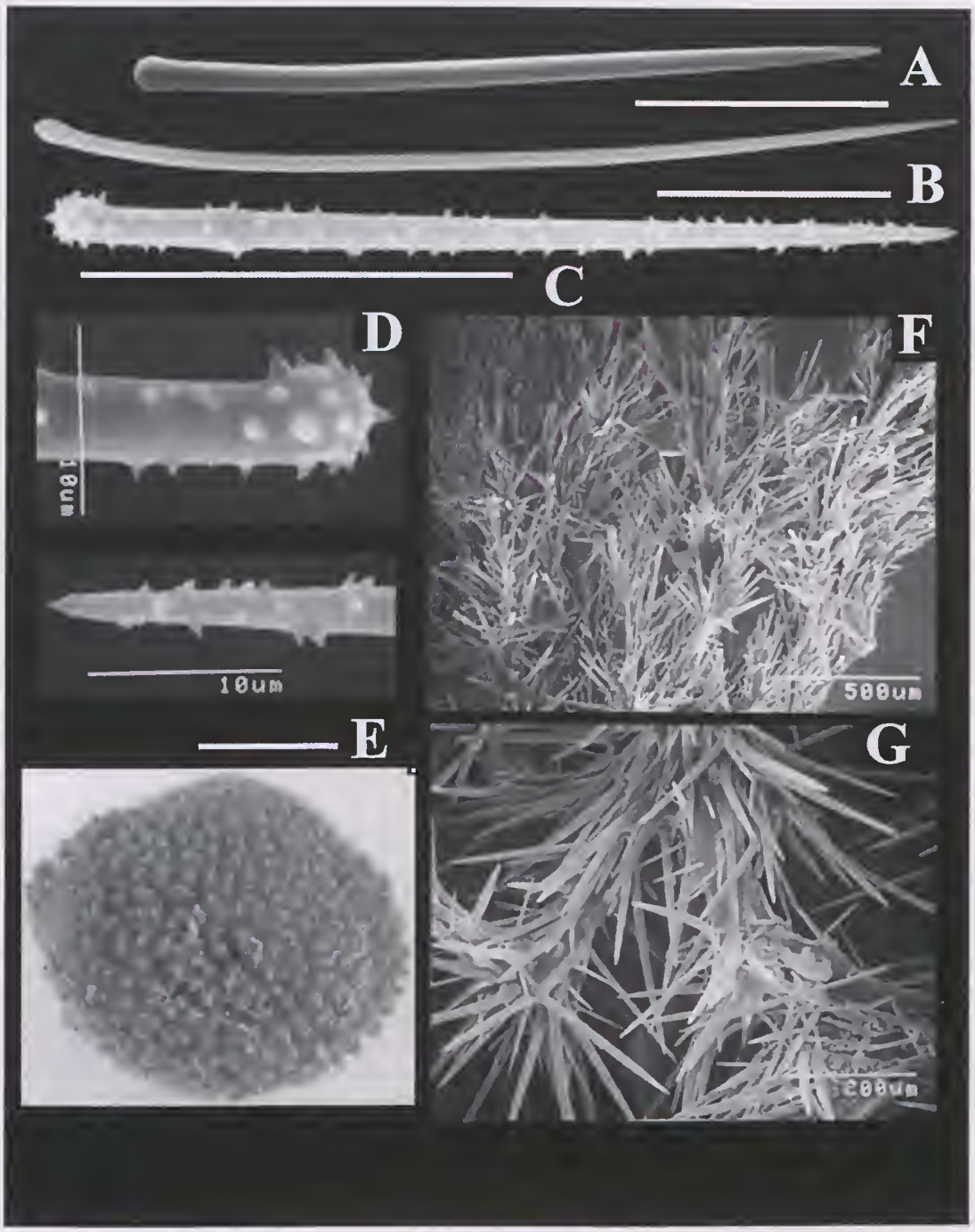

FIG. 4. *Aulospongus similiaustralis* sp. nov. (holotype QM-G300079). **A**, Choanosomal rhabdostyle with slight rhabd and distinct tyle (scale bar 100 µm). **B**, Subectosomal subtylostyle (scale bar 50 µm). **C**, Acanthostyle (scale bar 50 µm). **D**, Basal and distal spination of acanthostyle (scale bar 10 µm). **E**, Specimen (QM-G315610) top view (scale bar 5 cm). **F**, SEM of skeletal structure, showing the dense plumose fibre-bundles cored by choanosomal rhadostyles (scale bar 500 µm). **G**, SEM of choanosomal brush, showing arrangement of choanosomal styles and echinating acanthostyles (scale bar 200 µm).

153°25.08'E, 11 m, 10.xii.2003, J.N.A. Hooper & S.D. Cook. QM-G304007, north side, Mudjimba I., Mooloolaba, Qld, 26°36'.6 S, 153°6.8' E, 11 m, 09.ii.1994, J.N.A. Hooper *et al.* QM-G304879, South Side, Mudjimba I., Mooloolaba, Qld, 26°37' S, 153°6.8'E, 12 m, 30.i.1995, J.N.A. Hooper, J.A. Kennedy & S.D. Cook. QM-G303963, Jew Shoal, Noosa Heads, Qld, 26°21.9'S, 153°6.6'E, 20 m, 9.ii.1994, J.N.A. Hooper *et al.* QM-G315777, North Halls, Sunshine Coast, Qld, 26°20.4' S, 153°4.1' E, 21 m, 13.x.1999, S.D. Cook *et al.* QM-G315732, Jew Shoal, Noosa Heads, Qld, 26°22.3' S, 153°7.3' E, 18 m, 12.x.1999, S.D. Cook *et al.*. QM-G317276, Pandanas and Burkitt Points, Bargara, Qld, 24°48.2' S, 152°27.4' E, 6 m, 9.x.2000, S.D. Cook *et al.* QM-G306292, SW side of Little Woody I., Hervey Bay, Qld, 25°20'S, 153°1.5'E, 19 m, 18.xi.1995, J.N.A. Hooper *et al.* QM-G315610, eastern side of Wistari Reef, Capricorn Bunker Group, GBR, Qld, 23°28.5' S, 151°52.5' E, 15 m, 9.vi.1999, M. Garson, J. Simpson, & R. Clarke.

Habitat and Distribution. Coral reef, rock or rubble and sandy substrates, 6–21 m depth range. The known species range is from North Stradbroke Island, Moreton Bay, to the Keppel Is., Great Barrier Reef, Qld (Fig. 2D). Recently another single, so far unpublished, specimen of this species was recorded from the East Point Sponge Gardens, Darwin Harbour, NT (B. Alvarez pers. comm.) indicating a much more widespread distribution albeit very rare on the NW coast.

Description. *Shape.* Thickly encrusting globular, bulbous, spherical or subspherical sponges, ranging from 4–15 cm diameter and 2.5–6 cm. The globular growth form is composed of densely compartmentalised plumose columns, with columns flattened (24–36 x 0.5–1 mm) and arranged perpendicular to surface.

Colour. Bright orange; beige in preservative.

Oscules. Not observed.

Texture and surface characteristics. Velvety and compressible, can be torn easily. Surface is hispid and perpendicular columns of amalgamated spiculose fibre-bundles are inter-connected by a thin layer of spongin.

Ectosome and subectosome. No specialised ectosome is present although larger choanosomal rhabdostyles penetrate the surface arising from the underlying plumose fibre-bundles in the peripheral choanosomal skeleton. The dense arrangement of projecting rhabostyles produces a disorganised ectosome rather than a palisade-like structure typical of other raspailiids. Subectosomal subtylostyles are also organised in a plumose arrangement but they are sparsely distributed, predominantly in the peripheral skeleton. A darkly pigmented layer of collagen is present just below the surface, 100–150 μm thick.

Choanosome. Each perpendicular column arising from the choanosome to the peripheral skeleton consists of several bundles of amalgamated plumose fibre-bundles (each 50–100 μm in diameter), cored by multispicular tracts of choanosomal rhabdostyles coring and projecting from moderately heavy spongin fibres, and together with moderately abundant echinating acanthostyles form distinctly plumose ascending columns, 300–600 μm in diameter, without any apparent reticulate spicule or fibre interconnections. Spicules are dense and project obliquely from fibres. Long, thin subectosomal subtylostyles project from columns only sparsely. Lightly pigmented collagen is distributed throughout the choanosome.

Megascleres (refer to Table 3 for dimensions). Choanosomal rhabdostyles are robust, tapering to sharp points, only slightly rhabdose at the base with curvature proximal to the base. The basal tyle is typically swollen with a subtylote constriction, less often without pronounced swelling and only faint curvature.

Subectosomal subtylostyles are long, thin, often curved at the centre or towards the basal end, with the basal subtylote swelling small but with a pronounced subtylote constriction, and slightly rhabdose base.

Echinating acanthostyles are long, slender, prominently subtylote, with only a very faint rhabdose basal curvature. Small spines evenly distributed along the shaft except for a bare point, and basal tile covered with small spines. Spines are erect or slightly recurved, and less than 1 μm long.

Remarks. In its superficial growth form (encrusting bulbous, globular), surface features (conulose or papillose), live colouration (orange or red), possession of slightly rhabdose megascleres, and choanosomal structure (bundles of perpendicular spicule tracts) this species is remarkably superficially similar to *Dragmacidon australe* (Bergquist, 1970) (Halichondrida: Axinellidae). However, these similarities are purely convergent as demonstrated by differences in spicule composition between the two species (with *D.*

australe having only styles and oxeas, the former slightly rhabdose). Another superficial comparison is with *Dragmaxia variabilis* (Whitelegge) (Halichondriidae), which has a similar skeletal structure consisting of skeletal columns with spicules obliquely directed towards the surface, but the principal spicules in *A. similiaustralis* are distinctly plumose in formation, choanosomal styles and echinating acanthostyles are both rhabdose (albeit with poorly developed rhabds), and *D. variabilis* also contains trichodragmata and raphides. The new species clearly belongs to *Aulospongus* in having dense plumose fibre-bundles cored by rhabdostyles forming ascending columns, closely arranged at the base of the sponge, and separating completely towards the surface of the sponge, or into compartments, and structural styles and echinating acanthostyles of similar geometry, both characteristic for the genus. In contrast, other raspailiids with rhabdostyles, *Raspailia (Raspaxilla)*, have choanosomal principal styles geometrically different from echinating acanthostyles, the choanosomal principal styles lack any basal rhabd, and there are no discrete ascending fibre-bundles forming columns but instead with well differentiated axial and extra-axial skeletons (Hooper 2002).

The present species is most similar to *A. tubulatus* (Bowerbank, 1873), described from the western Indian Ocean to Sri Lanka, in possessing discrete surface conules produced by fibre-bundles and columns, a red or pinkish live colouration, and both having poorly developed rhabdose bases on both choanosomal rhabdostyles and echinating acanthostyles. The two species differ in other aspects, with *A. tubulatus* having some reticulate aspicular fibres interconnecting ascending columns, a massive tubular or subspherical growth form, lacking subectosomal styles but having instead smaller ectosomal rhaphiform styles, and patterns of spination and specific dimensions of spicules differing substantially (Table 3) (Hooper *et al.* 1999). In its spination *A. similiaustralis* is unusual amongst *Aulospongus* in having echinating acanthostyles more or less completely and evenly spined (similar to *Raspailia* species), whereas these spicules in most *Aulospongus* species have a smooth base and spined only or predominantly on the distal part of the shaft and point. Refer to Hooper *et al.* (1999) for a comparison with other known species of *Aulospongus*.

Etymology. This species is named for its remarkable superficial resemblance to *Dragmacidon australe* (Bergquist, 1970), formerly allocated to *Pseudaxinella*.

Sollasella Lendenfeld, 1887

Definition. Raspailiidae with strong axial column of confusedly aligned oxeas and styles, and with extra-axial columns of short oxeas and long and short styles positioned at right angles to the axial column. At the surface there is a characteristic ornamentation of polygonally arranged inhalant (?) pores and the oxeas form a continuous palisade of brushes of oxeas pierced by long styles. A low proportion of short acanthostyles may be present.

Sollasella moretonensis Van Soest et al., 2006 (Fig. 5A, 9A)

Sollasella moretonensis Van Soest, Hooper, Beglinger & Erpenbeck, 2006: 140–143, figs 4–5, Table 2.

Material Examined. Specimens as listed in Van Soest *et al.* (2006).

Habitat and Distribution. This species is moderately common in waters outside and adjacent to Moreton Bay, extending up to Noosa on the Sunshine Coast, associated with muddy substrata at the base of coral reefs, with a known depth range of 11–31 m (Fig. 5A).

Remarks. All known material of this species was recently described and published by Van Soest *et al.* (2006), with the holotype (QM-G303227), paratype and six specimens collected from the eastern side of North Stradbroke I. (type locality, 27.40083°S, 153.53°E) up to the northern end of the Sunshine Coast (26.3461°S, 153. 067°E), one from Shelburne Bay, north Qld (11.61722°S, 143.06889°E), and one very disjunct specimen from the vicinity of Cape Jaubert, north coast of WA (19.76667°S, 118.21667°E). As noted in Van Soest *et al.* (2006), the two isolated records in Shelburne Bay and Cape Jaubert were from commercial and scientific trawls made in deeper muddy substrates, and suggest that the species may have a wider distribution than presently known, or a disjunct distribution in tropical Australia, although this pattern is still unclear given that there has been intensive sampling of areas in between without trace of this species.

The species is very distinctive morphologically. It is bright orange to orange-brown in life, with a vasiform to fan-shaped growth form bearing rounded 'lumpy' margins, usually attached to the substrate by a short cylindrical woody holdfast. Texture is harsh, slightly hispid, firm and stiff, and the surface has a distinctive polygonal plate-like pattern formed by shallow pits surrounding low conules, each perforated by an oscule with a raised lip at its apex, pigmented more darkly than the surrounding area, and reminiscent of typical *Polymastia* surface patterns.

Subfamily Thrinacophorinae Hooper, 2002

Ceratopsion Strand, 1928

Definition. Raspailiidae lacking echinating spicules, having an axially compressed choanosomal skeleton with reticulate fibres cored by sinuous styles or anisoxeas and a well differentiated radial extraaxial skeleton cored by longer megascleres.

Ceratopsion clavatum Thiele, 1898
(Fig. 5B, 9B)

Ceratopsis clavata Thiele, 1898: 57, pl.5, fig.23, pl.8, fig.42a–c.

Ceratopsion clavata – Hooper, 1991: 1328, table 18. Hooper & Lévi, 1993: 1287–1291, figs 35–37, table 15.

Material Examined. NORTHERN NSW: QM-G301426, The Nursery/ Cod Hole, NE of Julian Rocks, Byron Bay, 28°36.13'S, 153°37.12'E, 17m, J.N.A. Hooper & S.D. Cook, 3.ii.1993. SOUTHEAST QLD: QM- G301289, Hanlon Light, Moreton Bay, 27°28.5'S, 153°20.9'E, 10 m, J.N.A. Hooper & S.D. Cook, 3.xi.1992. QM-G303975, North side of Mudjimba I., off Mooloolabah, 26°36.12'S, 153°6.15'E, 11 m, J.N.A. Hooper *et al.*, 9.ii.1994. QM-G320226, precise locality unknown, Deception Bay, Moreton Bay, Qld, QDPI Fisheries, FV 'Southern Intruder' Scallop Survey, 11.x.2002, trawl. GREAT BARRIER REEF, QLD: QM-G303862, S Triangle Reef, Hook Reef, Whitsunday region, 19°49.03'S, 149°7.02'E, 28 m, J. Hooper & L.J. Hobbs, 9.xii.1993. QM-G304371, NW of Lizard I., W. of Underwood Shoal, 14°35.02'S, 145° 20.13'E, 24 m, DPI on FV 'Gwendoline May', 9.iv.1994, trawl. QM-G320714, Mid Reef, Howick Group, 14°26.89'S, 144°52.88'E, 23 m, J. Hooper, *et al.*, 3.vii.2003. QM-G320792, Houghton Reef, Howick Group, 14°31.19'S, 144° 58.89'E, 20 m, J.N.A. Hooper *et al.*, 3.vii.2003. QM-G304918, QM-G304916, precise locality unknown, N. Coleman, 13.v.1994. QM-G306716, Petricola Shoals, NE. of Lizard I., 14°37.13'S, 145°28.08'E, 23 m, J. Hooper & P.A. Tomkins, 6.iii.1996. CORAL SEA TERRITORIES, off QLD: QM-G320588, Wilson Reef, 13°40.36'S, 144°13.59'E, 36 m, J.N.A. Hooper *et al.*, 1.vii.2003. QM-G320634, Davie Reef, 13°59.22'S, 144°26.47'E, 23m, J.N.A. Hooper *et al.*, 1.vii.2003. QM-G320685, Munro Reef, 14° 18.15'S, 144°48.81'E, 23 m, J.N.A. Hooper *et al.*, 2.vii.2003. PAPUA NEW GUINEA: QM-G312952, Keppel Point, Hood Bay, SE Papuan Lagoon, 10°8.13'S, 147° 54.15'E, 35 m, J.N.A. Hooper & M. Kelly, 16.xii.1996. QM-G312936, 12 mile sandbank, Kupiano, SE Papuan Lagoon, 10°11.05'S, 148°10.13'E, 20 m, J.N.A. Hooper & M. Kelly, 15.xii.1996. Further material as listed in Hooper (1991) and Hooper & Lévi, (1993).

Habitat and Distribution. Coral and rock substrates, 10–130 m depth (deeper samples from New Caledonia). Possibly very widely distributed in the tropical and subtropical Indo-west Pacific although so far only with confirmed distributions reported from Sagami Bay, Japan (type locality), south-west lagoon of New Caledonia (Hooper & Levi 1993), Southern Papua New Guinea Barrier Reef, Coral Sea territories, Great

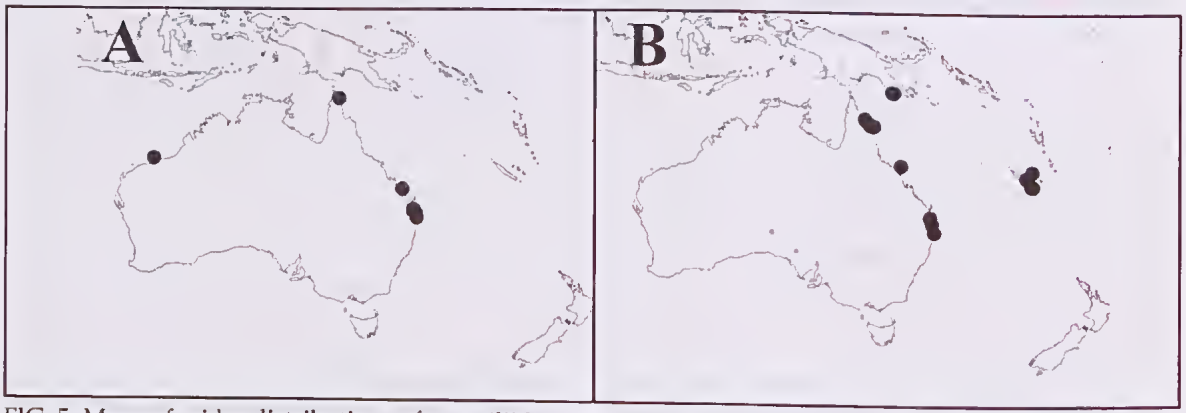

FIG. 5. Maps of wider distributions of raspailiid species found in Moreton Bay. **A**, *Sollasella moretonensis*. **B**, *Ceratopsion clavata*.

Barrier Reef, South East Qld to northern NSW (present study) (Fig. 5B).

Remarks. This species is well-recognisable by its yellow to pale orange colouration in life, an arborescent digitate morphology ranging from bushy to elongate digitate or whip-like, and a prominently conulose surface. It was comprehensively redescribed by Hooper & Lévi (1993) from New Caledonian and Moreton Bay specimens, with the present study greatly extending its known distribution from southern PNG to subtropical eastern Australia.

Subfamily Echinodictyinae Hooper, 2002

Echinodictyum Ridley, 1881

Definition. Raspailiidae with an exclusively reticulate choanosomal skeleton, without any trace of axial compression, cored exclusively by smooth oxeas, and vestigial radial extra-axial and ectosomal skeletons.

Echinodictyum asperum Ridley & Dendy, 1886
(Fig. 6A, 9C)

Echinodictyum asperum Ridley & Dendy, 1886: 477. Ridley & Dendy, 1887: 165, pl.32, fig.2; Whitelegge, 1897: 328–329; Topsent, 1897: 446, pl.20, fig.23; Burton & Rao, 1932: 348; Lévi, 1961: 524, fig.15; Desqueyroux-Faundez, 1981: 757, table II; Hooper, 1984: 55; Hooper, 1991: 1353-1356, figs 86–87, 110c, table 20.

Material Examined. MORETON BAY REGION, QLD: QM-G303197, Conjevoi Reef, off Sovereign Beach, east of Moreton I, 27°16.13'S, 153°25.08'E, 14 m, J.N.A. Hooper & S.D. Cook, 1.vi.1993. GREAT BARRIER REEF, QLD: QM-G314132, Lady Musgrave I., inside lagoon wall near entrance, 23°53.99'S, 152°24.62'E, 11 m, J.N.A. Hooper *et al*., 25.ii.1998. FAR NORTH QLD: QM-G303055, NE Cape Grenville, Shelburne Bay, 11°40.03'S, 143°4.03'E, 28 m, S.D. Cook on FV 'Clipper Bird', 25.iii.1993, trawl. QM-G303064, NE Cape Grenville, Shelburne Bay, 11°25.13'S, 143°52.03'E, 23 m, S.D. Cook on FV 'Clipper Bird', 27.iii.1993, trawl. QM-G316939, Torres Strait, 10°24.6'S, 142°41.40'E, 20 m, C. Bartlett on RV 'Gwendoline May', 13.i.2004, trawl. NORTHERN TERRITORY: QM-G303358, Stephen's Rock, West Arm, Darwin Harbour, 12°29.17'S, 130°47.18'E, 19 m, J.N.A. Hooper & L.J. Hobbs, 24.ix.1993. QM-G310228, Darwin Harbour, 12°17.58'S, 130°28.44, 13 m, Australian Institute of Marine Science NCI group, 20.viii.1987. QM-G313317, North of Bathurst Is, Arafura Sea, 11°19.98'S, 130°12.18'E, depth unknown, T. Wassenberg, CSIRO, 10.iii.1997, dredge. QM-G303566, Vernon Is, SSE of Lyne Reef, 12°7.0'S, 130°59.0'E, 30 m, Conservation Commission of the Northern Territory, 11.x.1993, dredge. QM-G301203, Flattop Bank, NE Joseph Bonaparte Gulf, Timor Sea, 12°16.0'S, 129°15'E, 32 m, J.N.A. Hooper, 17.v.1992, dredge. WESTERN AUSTRALIA: QM-G306039, NE of Dampier, 19°14.12'S, 117°36.10'E, 98 m, S.D. Cook on CSIRO RV 'Southern Surveyor', 1.ix.1995, dredge. PALAU ISLANDS: QM-G306396, QM-G306397, Kaibakku Tunnel, Ngeteklou, 7°19.08'N, 134°29.0'E, 8 m, J.N.A. Hooper, 14.xii.1995. FEDERATED STATES OF MICRONESIA: QM-G301245, Mortlock Is, Etal Atoll, NE section of lagoon, Chuuk, 5°34.09'N, 153°33.05'E, 22 m, Coral Reef Research Foundation, 9.vi.1992. Further material as listed in Hooper (1991).

Habitat and Distribution. This species is mostly found associated with hard rock and dead coral substrates, from subtidal to deeper water reefs (6–96 m depth). It is widely distributed from Tahiti to India, and from Chuuk Atoll to southeast Qld (Fig. 6A).

Remarks. This species has a wide distribution within the tropical Indo-west Pacific, with specimens examined from Papiete, Tahiti (type locality) (Ridley & Dendy 1886, 1887), to Tuticorin, India (Burton & Rao 1932), Tuvalu (Whitelegge 1897), Indonesia (Topsent 1897; Desqueyroux-Faundez 1981), Philippines (Lévi 1961), northwest Australia and Northern Territory (Hooper 1991), Chuuk, Palau and along the northeast coast of Australia from Torres Strait to the Moreton Bay region (present study). This is the first record of this species from the east coast of Australia. Interestingly, there is not yet any confirmed record of this species within the Gulf of Carpentaria, despite some significant sampling effort there, with an apparently disjunct distribution of western (west of the Wessel Islands, NT) and eastern populations (southeast of the Torres Straits, Qld). The species is characterised by a light brown to grey brown live colouration, with honeycomb-like dense reticulation of flattened branches forming spherical or irregular lobate masses, occasionally arborescent, with a firm, compressible but difficult to tear texture, and an optically uneven surface that is cavernous from the close-meshed reticulate branches.

Echinodictyum conulosum Kieschnick, 1900
(Fig. 6B, 9D)

Echinodictyum conulosum Kieschnick, 1900: 570–1. Hooper, 1991: 1370–1373, figs 95–96, 110h, table 24.

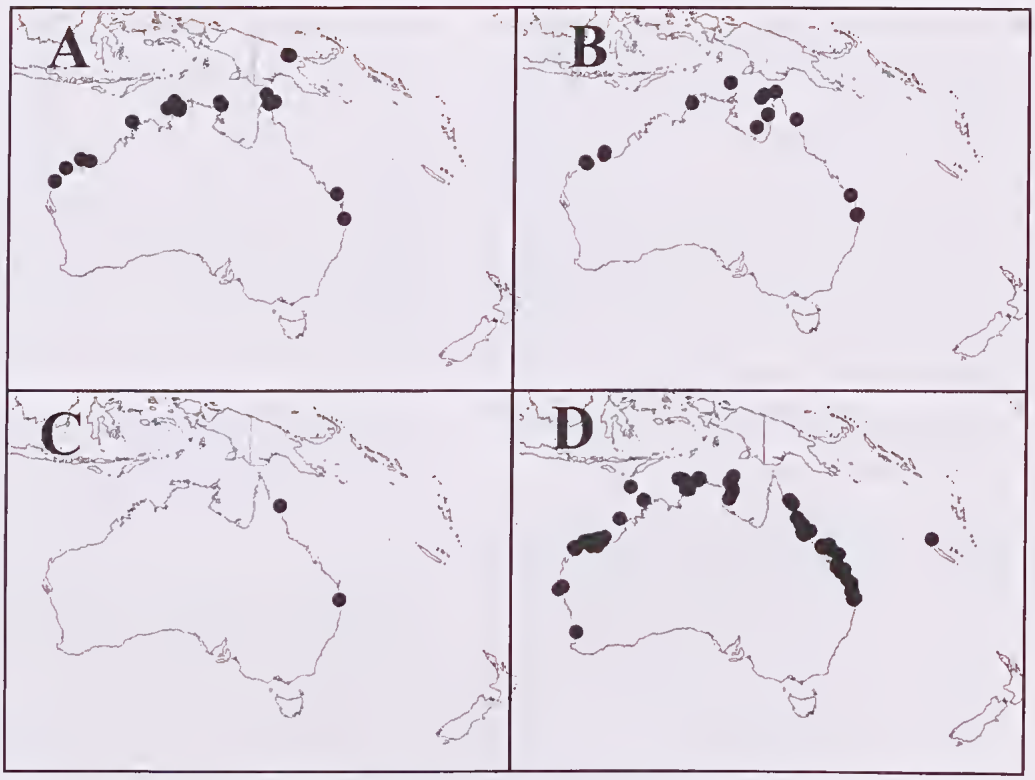

FIG. 6. Maps of wider distributions of *Echinodictyum* species found in Moreton Bay. **A**, *E. asperum*. **B**, *E. conulosum*. **C**, *E. luteum* sp. nov. **D**, *E. mesenterinum*.

Material Examined. SOUTHEAST QLD: QM-G317169, off Toondah Harbour, Cleveland, 27°30.91'S, 153°18.19'E, 8 m, J.A. Kennedy & T. Wassenberg, 2.viii.2000. QM-G317228, Myora Light, west side of North Stradbroke I, Moreton Bay, 27°28.10'S, 153° 24.07'E, 1 m, J.N.A. Hooper, 26.ix.2000. QM-G320278, Wellington Point, Moreton Bay, 27°30'S, 153°15'E, 1 m, S.A. List-Armitage, 15.iv.2003. CENTRAL QLD: QM-G317265, inshore reef at Pandanas and Burkitt Points, Bargara, 24°48.47'S, 152°27.72'E, 6 m, S.D. Cook *et al.*, 9.x.2000. FAR NORTH QLD: QM-G321041, Torres Strait, 10°51.0'S, 142°7.8'E, 16 m, C. Bartlett on FV 'Gwendoline May', 9.xi.2004, trawl. Further material as listed in Hooper (1991).

Habitat and Distribution. Shallow coastal and shallow offshore rock reefs, in mud or areas with high sedimentation rates; 1–84 m depth. Tropical and subtropical distribution from the Port Hedland region, WA, around to SE Qld (Fig. 6B).

Remarks. Even though Kieschnick's (1900) paper concerned species mainly from Ambon, Indonesia, the label on the holotype in the Phyletisches Museum in Jena, Germany (PMJ POR85) indicates that it was collected from Thursday I., Torres Strait. It was subsequently redescribed from extensive collections from mainly inshore turbid localities extending from the Northwest Shelf of WA, Darwin, NT, Gulf of Carpentaria, Qld, to the inner GBR, Qld (Hooper 1991). Present records extend this distribution substantially along the northeast coast of Australia to Moreton Bay, Qld. The species is jet black or black with a purple tinge when alive, usually silt covered in shallow water specimens, and has a cavernous reticulate growth form typical of *Echinodictyum* being elongate, conical, lobate or digitate, with short basal stalk. The texture is firm and flexible, and the surface is covered with numerous large conulose projections with pointed furry tips.

Echinodictyum luteum sp. nov.
(Figs 6C, 7, 9E, Table 4)

Material Examined. HOLOTYPE: QM-G304769, Nymph I., West of Lizard I., Great Barrier Reef, Qld, 14°39.0'S,

145°13.1'E, 17 m depth J.A. Kennedy, DPI Fisheries FV 'Gwendolyn May', 04.ix.1994, trawl. PARATYPES: QM-G317152, off Toondah Harbour, Cleveland, Moreton Bay, Qld, 27°30.91'S, 153°18.19'E, 8 m, J.A. Kennedy & T. Wassenberg, 02.viii.2000. QM-G306395, Kaibakku Tunnel Ngeteklou, Palau 7°19.08'N, 134°29.0'E, 8 m, J.N.A. Hooper, 14.xii.1995.

Habitat and Distribution. Found on rocky substrate and sheltered overhangs, from 8–17 m depth. The species is rare and the three known specimens are widely disjunctly distributed, from Moreton Bay, SE Qld, the northern Great Barrier Reef and Palau (Fig. 6C).

Description. *Shape.* Stalked, with a small basal attachment (1–3 cm long, up to 1 cm in diameter) and shrub-like body composed of partially or fully fused anastomosing branches, forming a close-meshed reticulate club or fan (6–14 cm high, 8–13 cm wide).

Colour. Yellow to yellow-brown both in life, and in ethanol, which it stains a light yellow.

Oscules. Not observed.

Texture and surface characteristics. Soft, fleshy and compressible sponge with cavernous reticulate structure. Tips of conules thrown up into points which give shaggy appearance, and are easily torn.

Ectosome and subectosome. Ectosome membranous, without any specialised raspailiid skeleton, but with a tangential layer of oxeas in sparsely confused arrangement lying immediately below the ectosome.

Choanosome. Primary and secondary tracts are multispicular and form an irregular yet well-defined reticulation with cavernous meshes. Individual oxeas are scattered throughout the choanosome within a lightly collagenous mesohyl. Primary and secondary tracts are regularly echinated by long slender acanthostyles.

Megascleres (refer to Table 4 for dimensions). Primary oxeas are long and thick, slightly curved centrally, with tapering sharp points.

Secondary oxeas are significantly thinner, less prominently curved than primary oxeas, and with blunter points.

Echinating acanthostyles are long, slender, mostly straight, with a slight subtylote swelling. Pattern of spination varies along the length of the spicule, being light and regular on the shaft, becoming more concentrated at the base and tip. Base is covered in clumped blunt and sharp spines, mostly erect, few recurved. The neck, below the tyle, has fewer erect sharp spines and few small blunt spines. Spination decreases in the upper-midsection of the shaft where they are erect and pointed, and then increases to larger recurved thorny spines along the lower-midsection and these continue to the point. The larger spines are up to 3 µm long.

Remarks. *Echinodictyum luteum* sp. nov. is unusual within the genus in its live yellowish colour, whereas most species are darkly pigmented (black, purple, dark brown), including a heavily pigmented mucus (Hooper 1991). This species also has characteristic long, slender and peculiarly spined acanthostyles, with spination varying from sharp and erect on the basal end to strongly recurved and thorny on the distal end. The morphology of acanthostyles was found to be a useful character to differentiate species of *Echinodictyum*, in an otherwise fairly homogeneous and morphologically depauperate group of sponges (Hooper 1991). In this character *E. luteum* sp. nov. is marginally most similar to *E. clathratum* Dendy from the Indian Ocean. Hooper (1991) provides a synopsis and illustrations of all known *Echinodictyum* species.

The significant disjunct distribution of this species from southeast Queensland, the Great Barrier Reef and Palau is also remarkable, and the species appears to be rare, with the assumption that it may occur in between this extensive geographic ranges. The only notable difference between Queensland and Palau specimens is the latter has marginally larger acanthostyles (Table 4).

Etymology. This species is named for its unusual colouration (from Latin *luteus*, yellow).

Echinodictyum mesenterinum (Lamarck, 1814) (Fig. 6D, 9F)

Spongia mesenterina Lamarck, 1814: 444.

Echinodictyum mesenterinum — Carter, 1882: 114; Ridley, 1884b: 185; Topsent, 1932: 101; Hooper, 1984: 55; Hooper, 1991: 1379–85, figs 100–103, 110i, table 25.

Spongia bilamellata Lamarck, 1816: 436 (in part, var. á).

Echinodictyum bilamellatum —Ridley, in Ridley & Duncan, 1881: 493, pl. 28, figs 1–6; Ridley, 1884: 454; Hentschel, 1911: 385; Hallmann, 1912: 299,

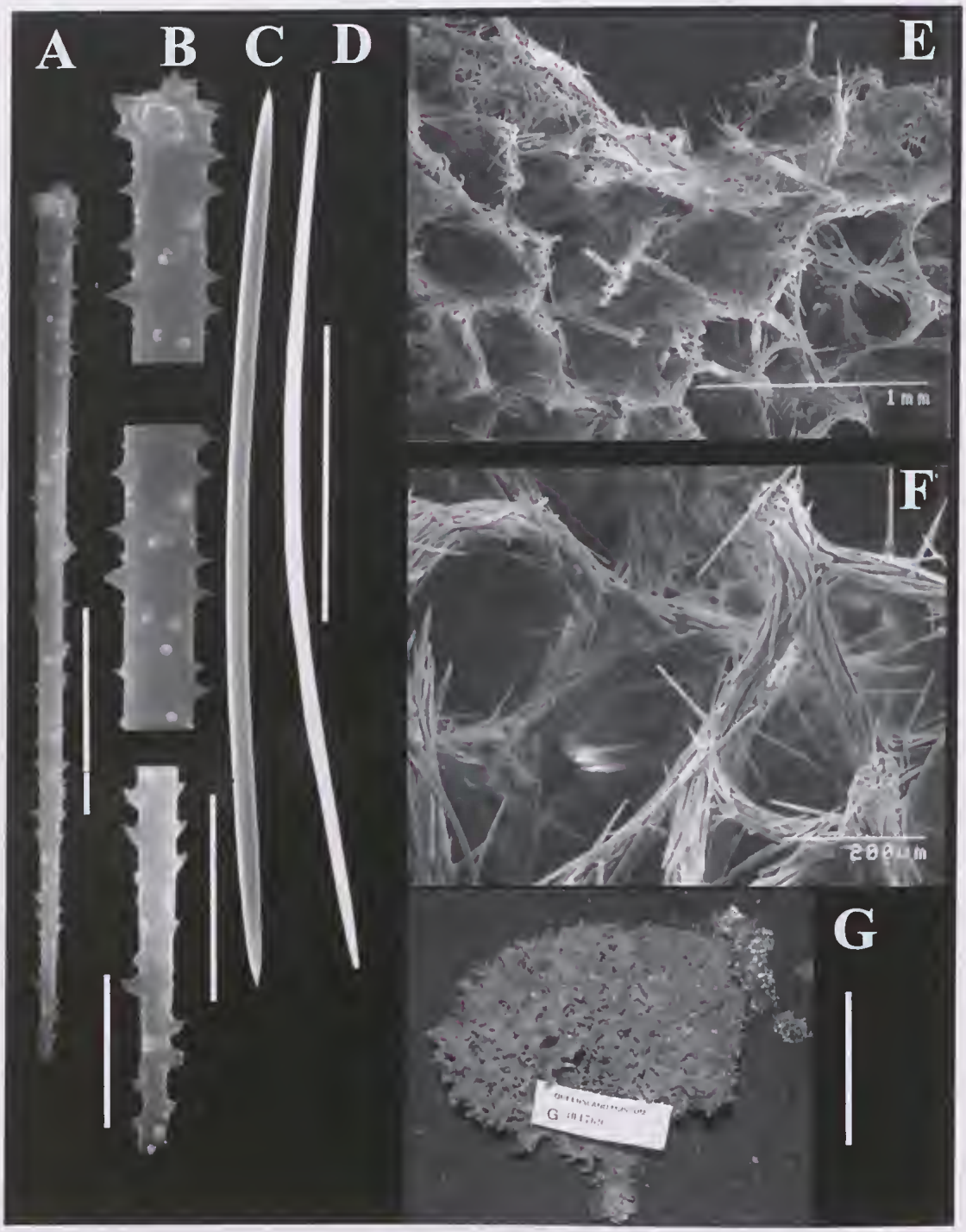

FIG. 7. *Echinodictyum luteum* sp. nov. (holotype QM-G304769). **A**, Echinating acanthostyle (scale bar 25 µm). **B**, Spination pattern on echinating acanthostyle (scale bar 10 µm). **C**, Primary choanosomal oxea (scale bar 100 µm). **D**, Secondary choanosomal oxea (scale bar 100 µm). **E**, SEM of skeletal structure, showing reticulation of multispicular tracts (scale bar 1 mm). **F**, SEM of choanosome, showing arrangement of oxeas and echination of acanthostyles (scale bar 200 µm). **G**, holotype on deck (scale bar 8 cm).

1914: 267; Dendy & Frederick, 1924: 504; Topsent, 1932: 69, 101, pl. 6, fig. 5; Topsent, 1933: 23; Burton, 1938: 15, 20; Guiler, 1950: 7.

Kalykenteron elegans Lendenfeld, 1888: 216; Hallmann, 1914: 267.

Echinodictyum elegans — Hallmann, 1912: 171, pl. 23, fig. 1, text-fig. 35.

Kalykenteron silex Lendenfeld, 1888: 217; Hallmann, 1914: 267.

Echinodictyum topsenti de Laubenfels, 1936: 63.

Thalassodendron typica —Whitelegge, 1901: 86 (in part); Hallmann, 1912: 171, 203. [Not *Thalassodendron typica* Lendenfeld, 1888: 233].

Echinonema vasiplicata Carter, 1882: 114; Ridley, 1884: 454; Hentschel, 1911: 385.

Material Examined. SOUTHEAST QLD: G315659, Sunshine Reef, Sunshine Coast, 26°24.77'S, 153°8.08'E, 27 m, S.D. Cook *et al.*, 11.x.1999. QM-G300883, Myora Reef, North Stradbroke I., Moreton Bay, 27°28.08'S, 153°24.10'E, 8 m, J. Hooper & S. Cook, 14.iv.1992. QM-G301280, off Banana Bouy to Pat's Point, 27° 33.08'S, 153°20.05'E, 3 m, K. Lamprell, M. Norman & C. Eddie, 1.x.1992, dredge. QM-G301303, E. side Peel I., Moreton Bay, 27°30'S, 153°24.0'E, 3 m, J. Hooper & S. Cook, 3.xi.1992. QM-G301304, Myora Light, W side North Stradbroke I., 27°28.10'S, 153°24.07'E, 4 m, J. Hooper & S. Cook, 3.xi.1992. QM-G303222, 1.85 nm off Peel I., 3.8 nm off Cleveland, Moreton Bay, 27°28.10'S, 153°20.08'E, 10 m, J.N.A. Hooper & S.D. Cook, 3.vi.1993, trawl. QM-G303238, Middle Reef, nth of North Stradbroke I., 27°24.05'S, 153°31.99'E, 30 m, J.N.A. Hooper & J.A. Kennedy, 4.vi.1993. QM-G313405, QM-G313409, Dunwich, North Stradbroke I., 27°30'S, 153°24.0'E, 1 m, S.D. Cook, 18.viii.1997. QM-G317154, QM-G317168, off Toondah Harbour, Cleveland, 27°30.91'S, 153°18.19'E, 8 m, J.A. Kennedy & T. Wassenberg, 2.viii.2000. QM-G320272, Wellington Point, Moreton Bay, 27°30'S, 153°15'E, intertidal, S. List-Armitage *et al.*, 15.iv.2003. QM-G303998, QM-G304004, N side of Mudjimba I., off Mooloolabah, Sunshine Coast, 26°36.12, 153°6.15'E, 11 m, J.N.A. Hooper *et al.*, 9.ii.1994. QM-G315107, Outer Gneerings, Sunshine Coast, 26°39.45'S, 153°12.89'E, 28 m, J.N.A. Hooper *et al.*, 15.x.1998. QM-G303959, Jew Shoals, Noosa Heads, Sunshine Coast, 26°21.15'S, 153°6.10'E, 20 m, J.N.A. Hooper *et al.*, 9.ii.1994. QM-G315107, Outer Gneerings, Sunshine Coast, 26°39.45'S, 153°12.90'E, 27.9 m, J.N.A. Hooper *et al.*, 15.x.1998. QM-G315659, Sunshine Reef, off Sunshine Coast, 26°24.77'S, 153° 8.08'E, 27 m, S.D. Cook *et al.*, 11.x.1999. QM-G315764, North Halls, off Sunshine Coast, 26°20.77'S, 153°4.0'E, 21 m, S.D. Cook *et al.*, 13.x.1999. QM-G306244, S side Woody I., Hervey Bay, 25°20.07'S, 152°59.10'S, 3 m, J.N.A. Hooper *et al.*, 17.xi.1995. QM-G306288, Sponge Gardens, SW of Little Woody I., Hervey Bay, 25°20.02'S, 153°1.08'E, 19 m, J.N.A. Hooper *et al.*, 18.xi.1995. GREAT BARRIER REEF, QLD: QM-G307500, N side Polmaise Reef, Capricorn-Bunker Group, 23°33.05'S, 151°39.15'E, 12 m, J.N.A. Hooper *et al.*, 12.viii.1996. QM-G307750, NE Point, Crab Spit, Low Isles, fore reef, 16°23.13'S, 145°34.05'E, 18 m, J.N.A. Hooper *et al.*, 16.i.1997. QM-G307862, SE tip of Wooded Islet, Low Isles, 16°23.13'S, 145°34.0'E, 16 m, J.N.A. Hooper *et al.*, 18.i.1997. QM-G314363, Curacao I. on west side, Palm Islands Group, 18°40.82'S, 146°32.62'E, 30 m, S.D. Cook *et al.*, 22.i.1999. QM-G314727, NE corner of Little Lindeman I., 20°25.32'S, 149°2.56'E, 22 m, S.D. Cook *et al.*, 2.vi.1999. QM-G314787, Cid Harbour, Whitsunday I., 20°16.82'S, 148°55.59'E, 18 m, S.D. Cook *et al.*, 2.vi.1999. QM-G314841, Alcyonarian Point, Hook I., Whitsunday Group, 20°3.93'S, 149°55.41'E, 15 m, S.D. Cook *et al.*, 3.vi.1999. QM-G314919, Cateran Bay, Border I., Whitsunday Group, 20°9.16'S, 149° 2.54'E, 30 m, S.D. Cook *et al.*, 4.vi.1999. QM-G315420, Chauvel Reef, 20°49.54'S, 150°20.13'E, 19 m, S.D. Cook *et al.*, 7.vi.1999. QM-G317316, Double Rock, Elliott Heads, 24°53.88'S, 152°29.53'E, 7.8 m, S.D. Cook *et al.*, 11.x.2000, SCUBA. QM-G317381, NE of Bustard Head, 23°53.92'S, 151°50.53'E, 31 m, QDPI Fisheries, 8.x.2000, trawl. QM-G317988, NE of Gladstone, 23°41.73'S, 151°31.09'E, 25 m, QDPI Fisheries, Scallop Survey on FV 'Seadar Bay', 18.x.2001, trawl. QM-G318409, Pompey Reefs, 21°22.68'S, 151°14.88'E, 19.2 m, S.D. Cook *et al.*, 18.ii.2000. QM-G319404, NE of Gladstone, 23°39.06'S, 151°33.04'E, 29 m, QDPI Fisheries Scallop Survey on FV 'C-King', 18.x.2001, trawl. QM-G319430, E of Gladstone, 23°51.59'S, 151°41.39'E, 30 m, QDPI Fisheries Scallop Survey on FV 'C-King', 19.x.2001, trawl. QM-G320125, Man and Wife I., Keppel Islands, 23°7.08'S, 150°59.45'E, 17.4 m, J.N.A. Hooper *et al.*, 6.xi.2002. QM-G320208, Big Peninsula, Great Keppel I., 23°9.03'S, 150°58.4'E, 12 m, J.N.A. Hooper *et al.*, 7.xi.2002. QM-G320241, QDPI Scallop Survey 106 Shot 41, 22°45.68'S, 151°4.73'E, QDPI Fisheries Scallop Survey on FV 'Southern Intruder', 15.x.2002, trawl. QM-G320741, Mid Reef, Howick Group, 14°26.89'S, 144°52.88'E, 23 m, J.N.A. Hooper *et al.*, 3.vii.2003. QM-G320757, Houghton Reef, Howick Group, 14°31.19'S, 144°58.89'E, 20 m, J.N.A. Hooper *et al.*, 3.vii.2003. QM-G321570, Sykes Reef, Heron I, 23°27.07'S, 152°2.33'E, 19.2 m, S.D. Cook *et al.*, 8 m, 9.xi.2004. QM-G321700, eastern end, NorthWest I., 23°26.0'S, 151°36.49'E, 20.8 m, S.D. Cook *et al.*, 10.xi.2004. QM-G321765, Rock Cod Shoal, 23°40.62'S, 151°37.10'E, 14 m, S.D. Cook *et al.*, 11.xi.2004. QM-G321821, SW of Fitzroy I., 16°55.59'S, 145°59.29'E, 20 m, S.D. Cook *et al.*, 24.xi.2004. QM-G321858, Normanby I., N end of Frankland Is, 17°12.24'S, 146°4.45'E, 13 m, S.D. Cook *et al.*, 25.xi.2004. QM-G321913, Gibson Reef, 17°18.35'S, 146°20.65'E, 24 m, S.D. Cook *et al.*, 26.xi.2004. QM-G321955, Hall-Thompson Reef, 17°36.58'S, 146°26.51'E, 15 m, S.D. Cook *et al.*, 26.xi.2004. CORAL SEA TERRITORIES. QM-G320434, Melville Passage, Tydeman Reef, 13°59.37'S, 144°29.95'E, 32 m, J.N.A. Hooper *et al.*, 29.vi.2003. QM-G320648, Munro Reef, 14°18.15'S, 144°48.81'E, 23 m, J.N.A. Hooper *et al.*, 2.vii.2003. GULF OF CARPENTARIA, NT: QM-G300780, E of Gove Peninsula, 13°48.03'S, 136°21.04'E, 18.8 m,

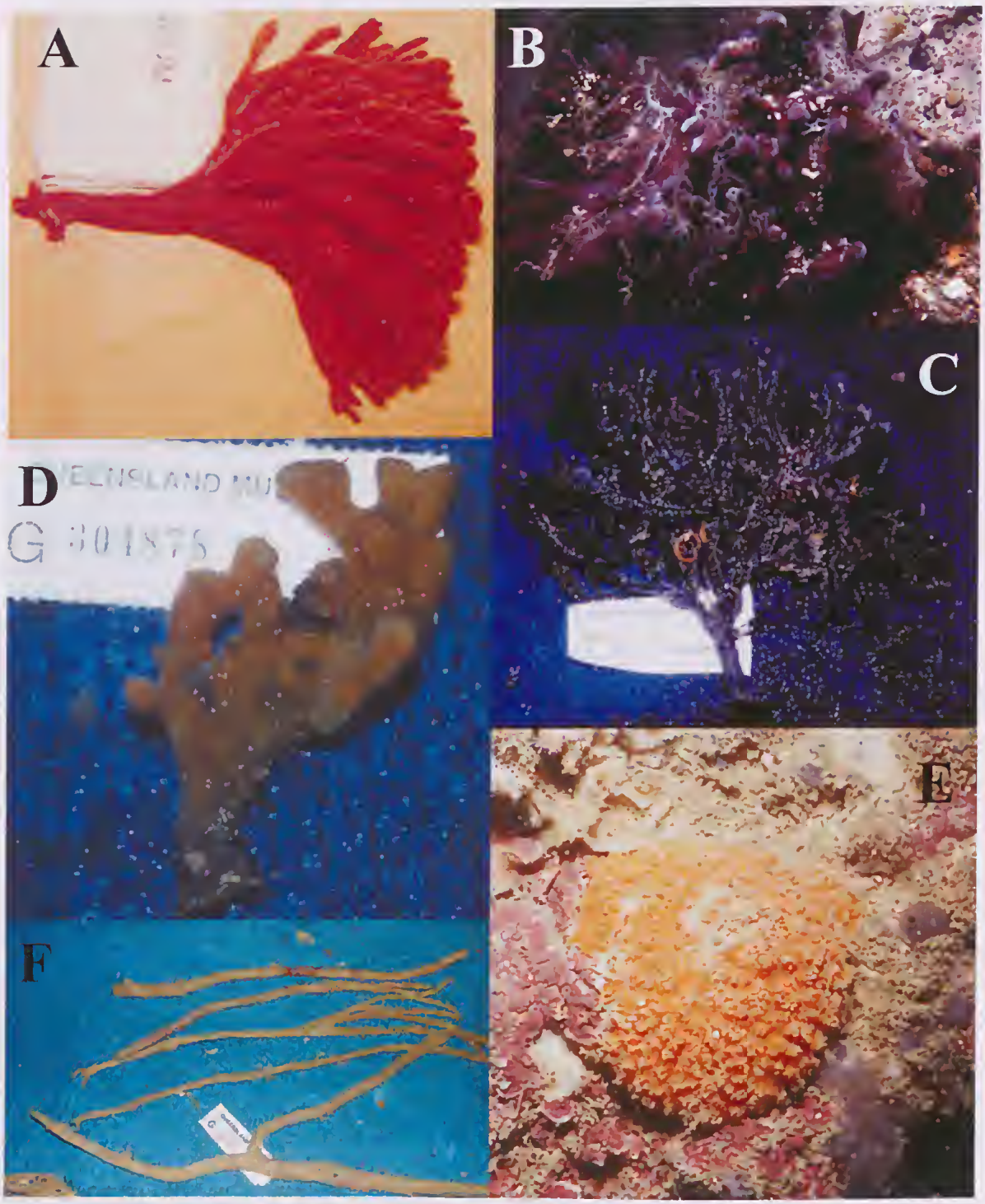

FIG. 8. Moreton Bay Raspailiidae fauna. **A**, *Raspailia (Raspailia) scorpa* sp. nov. (holotype, QM-G315208, on deck, from Moreton Bay). **B–C**, *Raspailia (Raspailia) kennedyi* sp. nov. (holotype, QM-G317177, alive and on deck, from Moreton Bay). **D**, *Raspailia (Raspaxilla) compressa* Bergquist (QM-G304878, on deck, from Mooloolaba). **E**, *Aulospongus similiaustralis* sp. nov. (QM-G303963, in situ, from Noosa). **F**, *Raspailia (Parasyringella) australiensis* Ridley (QM-G320811, on deck, Gulf of Carpentaria).

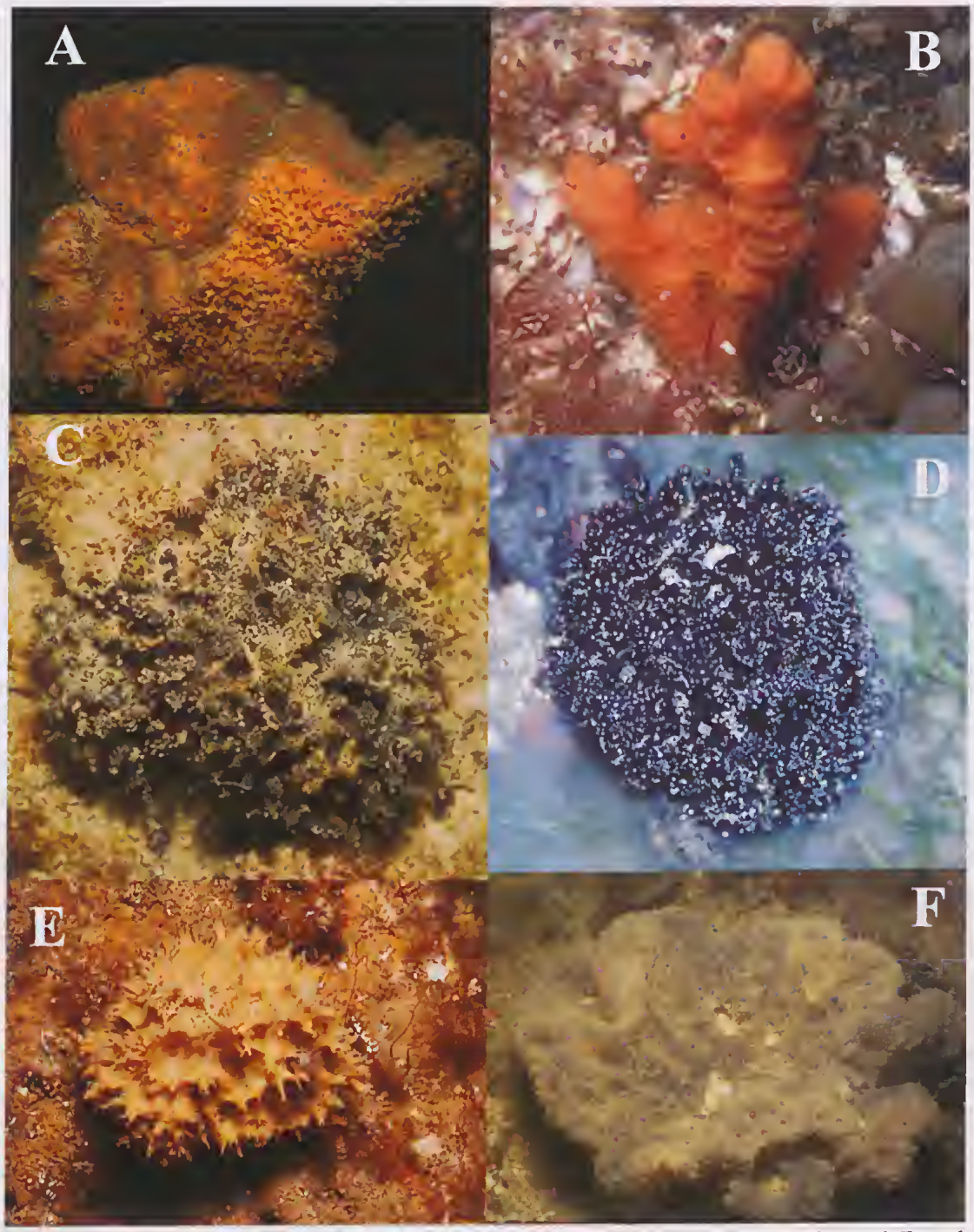

FIG. 9. Moreton Bay Raspailiidae fauna. **A**, *Sollasella moretonensis* Van Soest, Hooper, Beglinger & Erpenbeck (holotype, QM-G303227, in situ, from North Stradbroke I.). **B**, *Ceratopsis clavata* Thiele (specimen, QM-G301426, from Byron Bay). **C**, *Echinodictyum asperum* Ridley & Dendy (specimen, QM-G303197, in situ, from Moreton I.). **D**, *Echinodictyum conulosum* Kieschnick (specimen, QM-G317228, intertidal, from North Stradbroke I.). **E**, *Echinodictyum luteum* sp. nov. (paratype, QM-G306395, in situ, from Palau). **F**, *Echinodictyum mesenterinum* (Lamarck) (specimen, QM-G303959, in situ, Noosa).

S.D. Cook on CSIRO RV 'Southern Surveyor', 23.xi.1991, trawl. QM-G300792, E of Gove Peninsula, 12°37.02'S, 136°49.05'E, 26 m, S.D. Cook on CSIRO RV 'Southern Surveyor', 23.xi.1991, dredge. QM-G300818, E of Groote Eylandt, 13°1.08'S, 136°43.0'E, 22 m, S.D. Cook on CSIRO RV 'Southern Surveyor', 23 xi.1991, trawl. NORTHERN TERRITORY. QM-G303326, East Point Bommies, Darwin Harbour, 12°24.08'S, 130°48.13'E, 10 m, J.N.A. Hooper & L.J. Hobbs, 23.ix.1993. QM-G303429, Mandorah Jetty, Darwin Harbour, 12°26.1'S, 130°46.02'E, 9 m, J.N.A. Hooper & L.J. Hobbs, 25.ix.1993. QM-G313318, N of Bathurst I., Arafura Sea, 11°19.98'S, 130°12.18'E, 40 m, T. Wassenberg CSIRO, 10.iii.1997, trawl. QM-G314244, Arafura Sea, north of Cape Wessel, 10°45'S, 136°52.0'E, 53 m, S.P. Leys on CSIRO RV 'Southern Surveyor', 24.ix.1998, trawl. WESTERN AUSTRALIA. QM-G304585, Monkey Mia, Eastern Bluff, Peron Peninsula, Shark Bay, 25° 48'S, 113°45'E, subtidal, R. Smolker, Univ. Southern California, 21.vi.1994. QM-G306004, SW of Cape Jaubert, 19°27.13'S, 117°20.05'E, 86 m, S.D. Cook on CSIRO RV 'Southern Surveyor', 31.viii.1995, trawl. QM-G306009, NE of Dampier, 19°34.08'S, 117°14.15'E, 74 m, S.D. Cook on CSIRO RV 'Southern Surveyor', 31.viii.1995, trawl. QM-G306173, SW of Broome, 19°24.15'S, 118°3.03'E, 68 m, S.D. Cook on CSIRO RV 'Southern Surveyor', 6.ix.1995, trawl. NEW CALEDONIA. QM-G304705, Isle de Sable, 19°15'S, 163°48.0'E, 11 m, J. Vacelet, 25.iv.1989. SINGAPORE. QM-G313102, Pulau Tembakul (Kusu I.), Freyberg Channel, 1°13.08'N, 103°51.12'E, 18.7 m, J.N.A. Hooper & J.A. Kennedy, 2.v.1997. MALAYSIA. QM-G321087, SW peninsular, centre of bay W of T. Melano, 2°1.7'N, 109°39.2'E, 8 m, N.J. Pilcher, Marine Research Foundation, 30.v.2003. VIETNAM: QM-G300050, Off Han Rai I., Gulf of Thailand, 9°43.12'N, 104°20.10'E, 4 m, Y. Yakovlev on USSR RV 'Akademik Oparin', 29.x.1987. PHILIPPINES. QM-G304786, NW side Olango I., off Cebu, 10°16.05'N, 124°2.03'E, 23 m, Coral Reef Research Foundation, 8.ii.1994. Further material as listed in Hooper (1991).

Habitat and Distribution. Subtidal and shallow coastal rock, live and dead coral reefs, with a known bathymetric distribution from intertidal to 86 m depth. This species has a circum-Australian distribution, and also widely distributed throughout the Indo-west Pacific (see records also from Hooper 1991), and it is particularly common in tropical waters on both sides of the continent. The present study greatly expands the known distribution along the Great Barrier Reef down to Moreton Bay. The type locality is unknown other than 'Australian Seas', Peron and Lesueur collection (Fig. 6D).

Remarks. This species has been comprehensively redescribed by Hooper (1991), including its morphological variability across its extensive distribution, which from the present samples has expanded into the northwestern and southwestern Pacific. The species has a very characteristic growth form that has become aptly known as 'birds nest'. Sponges are typically erect, vasiform or cup-shaped, on a short stalk or attached to substratum directly. Live colouration is also fairly consistent and evenly pigmented dark purple or blue-purple throughout, varying only slightly depending on water depth and clarity. Texture is very harsh, only slightly compressible or flexible, and difficult to tear.

DISCUSSION

The present study increases the raspailiid fauna of the Moreton Bay region from three to eleven species including four new species; increases the known Australian fauna to 63 species; and significantly expands the known geographic ranges of many of these. Of the Moreton Bay species three are known only so far from this region and the southern Great Barrier Reef. Three other species extend into the northern tropical waters of the Northern Territory and/or Western Australian region, and five species have more extensive Indo-west Pacific distributions (Table 5). The occurrence of local (apparent) endemic species in the Moreton Bay region is well-known, with the region being a major biogeographic transition zone between the southern (Peronian) and northern (Solanderian) faunas. In addition to having a peculiar mix of both temperate and tropical species (e.g. Endean *et al.* 1956), the region is known to contain approximately 30 species of marine invertebrates found nowhere else, and which probably represent relics from once more widespread habitats, or still remain undetected in other enclaves along the coast (Davie & Hooper 1998). Most of the sponges studied here belong to the tropical fauna are at the southern-most point in their distributions. This number of apparent endemic species is likely to rise significantly with an increased taxonomic effort in this region, as demonstrated by the present discovery of new sponge species from what was thought to be a relatively well known fauna.

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